REMARKS/ARGUMENTS

Claims 1-2, 4, 7, 9, and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yahalom et al. (US 6,951,599, hereinafter "Yahalom") in view of Champagne et al. (US 5,980,708, hereinafter "Champagne"). Claims 5-6 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yahalom in view of Champagne and in further view of Weihs et al. (US 6,171,467, hereinafter "Weihs").

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yahalom in view of Champagne and further in view of Laletin et al. (US 2004/0128088, hereinafter "Laletin"). Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yahalom in view of Champagne and in further view of "*Faraday 1 Users Manual,*" published by *Obbligato Objectivesm, Inc* (2000) (hereinafter "Faraday").

It is respectfully submitted that the cited references fail, in several instances, to teach the elements for which they were cited, and favorable reconsideration of the claims is respectfully requested.

In overview, the present application is focused on a novel, improved electrochemical IR calculation and correction system for the precise measurement and control of the interfacial voltage drop at an electrode double layer. Applicants have found such precise control to be important in applications of ECMP, where the working electrode, i.e., a wafer with metal layers to be polished, is pressed against the polishing pad. In this situation, the layer of the electrolyte, i.e. of the slurry, is thin and has high resistance. This high Ohmic resistance makes the application of the true potential difference across the wafer/solution interface very uncertain, and yet, in this application a small (true) potential difference can mean the difference between the desired controlled removal of material, and a ruinous uncontrollable etching.

The claims do not attempt to broadly encompass the mere idea of IR correction. Rather, the novelty of the present claims lies in the way in which the IR correction is achieved, i.e., by deriving a potential step that is proportional to *ItRx,* i.e. to a product of a truer current and the unknown resistance.

The Yahalom reference generally relates to a method and apparatus for planarizing a substrate by electropolishing. The teachings of the Yahalom patent, however, are markedly different from the claimed invention. While the present claims require simultaneous electropolishing and chemical mechanical polishing, the Yahalom reference acknowledges both types of polishing, but states that "preferably, an electropolishing cell is used which **does not** simultaneously perform electropolishing and chemical mechanical polishing to a substrate" (column 4, lines 64-67 and column 5, lines 1-3). Thus, the techniques of Yahalom do not solve the problem faced by the applicants. Rather, Yahalom expressly uses a cell **without** the obstruction of the polishing pad.

Moreover, it is apparent that the electrolytes used in the Yahalom process are electrolytes normally used in electropolishing (phosphoric acid, sulfuric acid and other suitable electrolytes (column 5, lines 25 to 43)). These electrolytes are highly conductive and normally would not require the use of the IR compensation.

The Champagne reference generally relates to a high sensitivity multiple waveform voltametric method and instrument for use in electrochemical and other applications. More specifically, the Champagne patent relates to a device that would have the sensitivity to detect electrochemically active compounds in an electrolyte with a detection level in the order of 1 ppt (ng/liter) or less (column 4 line 19-20). The Champagne working electrode is either a drop of mercury, a solid electrode, or a film having selective properties. (column 13, lines 31-340). Champagne teaches one how to improve the sensitivity of MWV (Multiple Square Wave Voltametry).

In Champagne's Summary of the Invention, column 4 line 17 to column 8, line 29, the text between column 5 line 66 and column 6 line 24 describes the circuit for IR compensation, which is also a part of the Figure 1 and claim 34. The feedback circuit for compensating an Ohmic drop (in a cell having a pair of electrodes subjected to a pulsed potential difference, and a grounded electrode in which the current flows in response to the pulsed potential difference) comprises a current-to-voltage converter, a switch, control means for producing the switch signal to close or open (and thus to interrupt the signal) and a summing circuit for adding the voltage signal transmitted by the switch to the pulsed potential difference applied between the pair of electrodes.

This is a workable approach only if it is assumed that the impedance of the ground lead is negligible, and that the currents are relatively low. In Champagne's applications, the surface area of the working electrode is small, about one square millimeter (Column 1 line 36), and this circuit may be adequate. In contrast, in normal ECMP applications, the area of the wafer is 314 cm^2 or even 706.5 cm^2 (for 300mm wafers), and the currents which need to be applied are significantly higher. Thus the promising text on column 5, lines 35-38, does not materialize in normal environments, and a better solution (i.e., the present applicants' solution) is needed.

More importantly, Figures 16a-e of Champagne show the command signal and associated signals per the Champagne invention. In these Figures, it is quite clear that the initial current drop (which normally is caused by the IR drop) is neglected by Champagne and the integration is taken only in shaded areas. In contrast, in the present application, this initial current drop is of outmost importance,[1] and it is used (with the help of appropriate circuitry) to eliminate the IR drop (irrespective of true ground and applicable to large currents). Thus, Champagne's teaching, with or without Yahalom, could not help one hoping to find a solution to the problem of IR drop in ECMP.

The Laletin reference teaches about a time varying electrical excitation, which is applied to a system containing biologic and/or non-biologic elements, whereupon the time – varying electrochemical or electrical response is detected and analyzed. The experiments of Laletin are far removed from the problem solved by the present application. Laletin's electrodes are small, the cell is small, and the problem of IR compensation is neither discussed nor would it be applicable to a practical system of ECMP of normal substrates.

Finally, the Faraday reference is also inapposite here. As noted by the examiner, "Faraday discloses a potentiostat that is current limited (p2)". Actually every commercially available potentiostat is current limited (for safety), but this has nothing to do with the current clipping used in the present Applicants' approach to improved IR compensation. The current limiter in the present case acts on each current-time transient, and instead of letting current change as a spike with an exponential decay, (as shown for the square wave potential application in Figure 16 b, Champagne), the current is clipped to result in an almost square

[1] *See* claim 1: ("...measuring a voltage transient ... resulting from application of a substantially square step function test signal...").

wave of current. As such, Faraday does not supply a current limiter of use in the invention, nor does it contribute to solving the problem that the present Applicants' have solved and claimed.

Conclusion

Because the art does not teach the problem at issue or the solution derived by the Applicants, Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a further telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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